PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-190934
(43)Date of publication of application : 17.07.2001

(51)Int.Cl. B01D 63/00
A61M 1/18
B01D 63/02
B01D 69/08

(21)Application number : 2000-003691
(22)Date of filing : 12.01.2000

(71)Applicant : TOYOBO CO LTD
(72)Inventor : KATO MASAHIRO
KYO MOTOKI
HIDAKA HIDEJI

(54) HOLLOW FIBER MEMBRANE MODULE WITH A LITTLE EFFLUENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a module for an artificial dialysis with a little eluent from adhered parts.
SOLUTION: In the module fixed at both ends of a hollow fiber membrane with a resin, the hollow fiber membrane module is characterized in that the end-adhered parts of both ends cut off from the module are cut into small square pieces of about 1 cm and the pieces are immersed in warm water of 200 cc for 2 h at 40° C, extracted liquid of the eluent from the end-adhered parts is diluted 50 times, and the absorbance of the diluted liquid is not more than 0.03 at UV (245 nm).

LEGAL STATUS

[Date of request for examination]	24.04.2003
[Date of sending the examiner's decision of rejection]	03.03.2005
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The hollow fiber module which carries out beating of the edge jointing of the both ends which started the both ends of a hollow fiber from the module in the module fixed by resin to the magnitude of about 1cm angle, and is characterized by the absorbance in UV (245nm) of the diluent which diluted the extract which was immersed into 40 degrees C and 200 cc warm water for 2 hours, and extracted the effluent from edge jointing 50 times being 0.03 or less.
[Claim 2] The hollow fiber module according to claim 1 whose water permeability of a hollow fiber module is more than 50 ml/hr/m2 / mmHg.
[Claim 3] The hollow fiber module according to claim 1 or 2 using the hollow fiber to which the glycerol was made to adhere as a pit hold-back agent or a hydrophilization agent.
[Claim 4] The hollow fiber module according to claim 3 whose glycerol deposit efficiency is 50 - 75%.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the hollow fiber module used for artificial dialysis.
[0002]
[Description of the Prior Art] The hollow filament mold module for artificial dialysis is known for many years, was used for many people over the long period of time, and is contributed to many chronic-renal-failure patients' prolongation of life. the hollow filament mold module for artificial dialysis -- a hollow fiber -- a supply liquid side and a permeate liquid side -- liquid -- in order to divide densely, it has dried and pasted up. The hollow fiber for artificial dialysis has taken porous ******, and in order to hold porous structure in the desirable condition at the time of desiccation, the pit hold-back agent is used for drying shrinkage spinning etc. Moreover, in order to secure the hydrophilic property after desiccation, the film may be made to contain a hydrophilization agent in the hollow fiber which consists of hydrophobic matter.
[0003] Generally as the pit hold-back agent or hydrophilization agent for hemodialysis, the glycerol or the polyethylene glycol is used.
[0004]
[Problem(s) to be Solved by the Invention] The pit is made to hold by it being difficult for the hollow fiber using the glycerol and the polyethylene glycol as a pit hold-back agent to make a proper amount adhere to holding a pit in spinning, and always carrying out superfluous adhesion. Although urethane resin is mainly used for adhesion of the module for artificial dialysis, when there is much coating weight to the hollow filament of the glycerol used as a pit hold-back agent or a polyethylene glycol, an elution nature by-product may be generated. Therefore, in the eluting material test of jointing, there are some to which the absorbance of UV (245nm) which is dialysis mold hemodialysis apparatus acknowledgement criteria exceeds 0.05 or less, and most product yield fall factors of the module for artificial dialysis are occupied.
[0005] The water permeability of the hollow fiber used for artificial dialysis is high as low-molecular protein removal ability, such as beta2-microglobulin, is raised especially recently or the therapy approach called hemodialysis filtration which performs hemofiltration to hemodialysis and coincidence spreads widely. If the water permeability of a hollow fiber is generally raised, the amount of the pit hold-back agent adhering to a hollow filament will tend to increase. moreover -- if the spinning rate of a hollow fiber is raised in order to raise productivity -- spinning -- it will be in process, the pit hold-back agent accompanied to a hollow fiber will increase, and the amount of the pit hold-back agent which adheres to a hollow filament as a result will increase.
[Means for Solving the Problem] this invention persons traced the OH radical and urethane resin with which the glycerol which adhered superfluously, and a polyethylene glycol have the cause of generating of an elution nature by-product reacting, and generating urethane oligomer, as a result of inquiring wholeheartedly that these faults should be solved. Then, in the hollow fiber to which only the proper amount of a pit hold-back agent required for pit maintenance was made to adhere, it found out that generating of the urethane oligomer from jointing could be reduced extremely, and the absorbance in UV (245nm) came to obtain 0.03 or less hollow fiber module for artificial dialysis.
[0006] That is, this inventions are as follows.

** The hollow fiber module which carries out beating of the edge jointing of the both ends which started the both ends of a hollow fiber from the module in the module fixed by resin to the magnitude of about 1cm angle, and is characterized by the absorbance in UV (245nm) of the diluent which diluted the extract which was immersed into 40 degrees C and 200 cc warm water for 2 hours, and extracted the effluent from edge jointing 50 times being 0.03 or less.
** The hollow fiber module given [above-mentioned] in ** the given water permeability of a hollow fiber module is more than 50 ml/hr/m2 / mmHg.
** The above-mentioned ** using the hollow fiber to which the glycerol was made to adhere as a pit hold-back agent or a hydrophilization agent, or a hollow fiber module given in **.
** The hollow fiber module given [above-mentioned] in ** given glycerol deposit efficiency is 50 - 75%.
[0007] In this invention, in the hollow fiber to which only the proper amount of a pit hold-back agent required for pit maintenance was made to adhere, generating of the urethane oligomer from jointing can be reduced extremely, and the hollow fiber module for 0.03 or less artificial dialysis in the absorbance in UV (245nm) is obtained.
[0008] The proper amount of a pit hold-back agent is the case where a pit hold-back agent filling factor becomes 60 - 95% here. A pit hold-back agent filling factor shows the rate of the pit hold-back agent occupied in all membranous holes, and at 0%, a pit hold-back agent does not exist in a pit, but it is shown that all pits are filled up with the pit hold-back agent, and it is expressed by 100% by the following formulas.
Pit hold-back agent filling factor =(GL weight x (1-phi) (rhoPLY+phirhoGL))/(hollow filament weight x phixrho GL)
Here, for GL weight, the pit hold-back agent weight in a sample and hollow filament weight are the hollow filament weight of a sample, and phi is a void content and rhoPLY. A polymer consistency and rhoGL are pit hold-back agent consistencies. Since the engine performance of a hollow fiber can fully demonstrate a pit hold-back agent filling factor by making it this range and a superfluous pit hold-back agent does not exist in a hollow fiber outside surface, generating of a reaction by-product with urethane is desirable few. Even when a pit hold-back agent filling factor exceeds 95%, it is possible that it does not fill up with the pit hold-back agent completely in a hollow fiber hole. However, moisture is usually included, the pit hold-back agent which contains moisture when a pit hold-back agent filling factor exceeds 95% becomes the form where it overflows in a pit, it is confirmed by this invention person that the yield of a reaction by-product with urethane is not stopped, and the pit hold-back agent which actually exists in a hollow fiber is not desirable.
[0009] Although especially the water permeability of the hollow fiber in this invention is not limited, it demonstrates effectiveness 50 ml/hr/m2 / more than mmHg, and demonstrates especially effectiveness more than 150 ml/hr/m2/mmHg. Although especially the spinning rate at the time of the hollow fiber manufacture in this invention is not limited, by 50m/, above, it demonstrates effectiveness above by 75 morem/, and demonstrates especially effectiveness by 90m/at the above time.
[0010] The pit hold-back agent used for this invention is a glycerol or a polyethylene glycol, and is a glycerol preferably.
[0011] Although there is especially no limitation in the deposit efficiency of the pit hold-back agent which applies this invention, 50 - 75% is desirable. It is calculated here by the deposit efficiency = pit hold-back agent weight / hollow filament weight of a pit hold-back agent.
[0012] Although there is especially no hollow fiber material that applies this invention what is limited, a cellulose system, a cellulose acetate system, a polysulfone system, a polyacrylonitrile system, a polyamide system, etc. are mentioned.
[0013] Although not limited especially concerning the approach of making the suitable range the pit hold-back agent filling factor for attaining this invention By contacting the hollow filament after coming out of a pit hold-back agent immersion tub on a roller, making a hollow filament rub a guide etc. and writing it, after coming out of the approach and pit hold-back agent immersion tub which wipe off the pit hold-back agent adhering to a roller By removing the superfluous pit hold-back agent which went together and adhered to the hollow filament, it is possible to obtain a desirable pit hold-back agent filling factor.
[0014]

[Example] Although an example explains this invention further below, this invention is not limited to this.

[0015] (1) The measuring method of pit hold-back agent weight, hollow fiber weight, and the coating weight of a pit hold-back agent.

The shape of the shape of a loop formation and a bundle which prepares a suitable quantity (about 30g) of a hollow fiber is sufficient. If needed, when a core material is in the interior of a hollow filament, this is removed. Since moisture is usually contained in a hollow fiber, desiccation removes this. In the condition that moisture evaporation is not barred by the shape of the shape of a loop formation, or a bundle, 80 degrees C dries with a forced-air drier for about 20 hours. Under the present circumstances, although cautions are required when a pit hold-back agent tends to evaporate, in the glycerol and polyethylene glycol which are generally used, it is enough in 80 degrees C and about 20 hours. The weight after desiccation is measured and let this be hollow fiber weight. After pure water's fully washing the hollow fiber sample after a gravimetry and removing an adhering pit hold-back agent completely, a bone dry is carried out, and let weight as measurement and let (weight after a hollow fiber weight-bone dry) be pit hold-back agent weight. (Pit hold-back agent weight / hollow fiber weight) is the deposit efficiency of a pit hold-back agent here.

[0016] (2) Calculate the measuring method void content of a pit hold-back agent filling factor by the well-known approach. For example, it can measure by the following approaches. Humidity and a pit hold-back agent are fully removed for a hollow fiber in pure water, superfluous moisture is appropriately removed by the filter paper, centrifugal separation, an air drying, etc., and weight is measured. an after that bone dry -- a gravimetry is carried out and a void content is calculated from the consistency of a hollow fiber polymer, a pit hold-back agent consistency, and the hollow fiber weight before and behind a bone dry. Moreover, it is also possible to calculate from the measurement using a pycnometer and the spinning conditions at the time of production (the discharge quantity of a polymer, spinning speed, the bore of the obtained hollow fiber, thickness). The consistency of a polymer and a pit hold-back agent can be measured by the well-known approach, using a reference value. If a void content can be found, a pit hold-back agent filling factor will be calculated from a polymer, a pit hold-back agent consistency, pit hold-back agent weight, and hollow fiber weight.

[0017] [Example 1] The hollow fiber which consists of a cellulose acetate system macromolecule as a hollow fiber for hemodialysis applicable to this invention was produced by the following approaches. Cellulose triacetate 20 % of the weight, N-methyl-2-pyrrolidone The uniform spinning undiluted solution which consists of 24 % of the weight of triethylene glycols was produced 56% of the weight. 30-degree C N-methyl-2-pyrrolidone which used the liquid paraffin as the liquid in hollow, extruded said spinning undiluted solution from the double spinneret to coincidence as a 130-degree C condition, and was prepared caudad 50mm 14 % of the weight, triethylene glycol 6 % of the weight, water After being immersed into the coagulation liquid which consists of 80 % of the weight and rinsing, it is 1-2 to a glycerol. You make it immersed during a second. The glycerol which adhered to the hollow filament superfluously is removed by wiping off the glycerol which adhered on the hollow filament taking over roller until it results [from a glycerol immersion tub] in a desiccation process by roller-like sponge. Spinning rate 80 m/min after making it dry in hot blast It rolls round by the winder. Thus, the rolled-round hollow filament was processed into the module.

[0018] [Example 2] The hollow fiber which consists of a cellulose acetate system macromolecule as a hollow fiber for hemodialysis applicable to this invention was produced by the following approaches. Cellulose triacetate 20 % of the weight, N-methyl-2-pyrrolidone The uniform spinning undiluted solution which consists of 24 % of the weight of triethylene glycols was produced 56% of the weight. 30-degree C N-methyl-2-pyrrolidone which used the liquid paraffin as the liquid in hollow, extruded said spinning undiluted solution from the double spinneret to coincidence as a 130-degree C condition, and was prepared caudad 50mm 14 % of the weight, triethylene glycol 6 % of the weight, water It is a glycerol, after being immersed into the coagulation liquid which consists of 80 % of the weight and rinsing 1-2 You make it immersed during a second. The glycerol which adhered to the hollow filament superfluously is removed by making it run, rubbing a hollow filament in two or more guides by the air transit part until it results [from a glycerol immersion tub] in a desiccation process. Spinning rate 80 m/min after making it dry in hot blast It rolls round by the winder. Thus, the rolled-round hollow filament was processed into the module.

[0019] [Example of a comparison] The hollow fiber which consists of a cellulose acetate system macromolecule as a hollow fiber for hemodialysis applicable to this invention was produced by the following approaches. Cellulose triacetate 20 % of the weight, N-methyl-2-pyrrolidone The uniform spinning undiluted solution which consists of 24 % of the weight of triethylene glycols was produced 56% of the weight. 30-degree C N-methyl-2-pyrrolidone which used the liquid paraffin as the liquid in hollow, extruded said spinning undiluted solution from the double spinneret to coincidence as a 130-degree C condition, and was prepared caudad 50mm 14 % of the weight, triethylene glycol 6 % of the weight, water It is a glycerol, after being immersed into the coagulation liquid which consists of 80 % of the weight and rinsing 1-2 You make it immersed during a second. Spinning rate 80 m/min after drying a hollow filament [having come out of a glycerol immersion tub] in hot blast It rolls round by the winder. Thus, the rolled-round hollow filament was processed into the module.
[0020] Beating of the edge jointing of the both ends which started the both ends of the above-mentioned hollow fiber from the module in the module fixed by resin was carried out to the magnitude of about 1cm angle, and the absorbance in UV (245nm) of the diluent which diluted the extract which was immersed into 40 degrees C and 200 cc warm water for 2 hours, and extracted the effluent from edge jointing 50 times was measured. A result is shown in Table 1.
[0021]
[Table 1]

吸光度(UV245)	実施例1	実施例2	比較例
平均値	0. 018	0. 024	0. 045

[0022] The path clearance of a vitamin-B12 myoglobin was measured on condition that amount of amount of temperature blood side streams of 37 degrees C 200 ml/min dialysing fluid side streams 500 ml/min as an index of the ultrafiltration rate (Following UFR and abbreviation) of 37-degree-C pure water of the above-mentioned module, and the penetrable ability of the hemodialyzer. A result is shown in Table 2.
[0023]
[Table 2]

	実施例1	実施例2	比較例
UFR	168	171	182
ビタミンB12クリアランス	118	117	120
ミオグロビンクリアランス	30	31	33

Unit UFR : ml/(hr-m2 and mmHg)
Path clearance : ml/min [0024] It asked for the glycerol deposit efficiency of the hollow fiber before assembling to the above-mentioned module, the void content, and the glycerol filling factor. The consistency of cellulose triacetate set the consistency of 1.3 and a glycerol to 1.26 in count. A result is shown in Table 3.
[0025]
[Table 3]

	実施例1	実施例2	比較例
グリセリン付着率	64%	62%	74%
空孔率	72%	71%	73%
グリセリン充填量	90%	88%	102%

[0026] It turns out that the absorbance of UV (245nm) of the module using the hollow filament to

which removed the glycerol which adhered to the hollow filament superfluously from the result of Table 1, and only the proper amount made the glycerol adhere falls compared with the example of a comparison, and has become 0.03 or less.

[0027] As for the result of Table 2, only a proper amount shows that what has the water permeability of the module using the hollow filament to which the glycerol was made to adhere and penetrable ability equivalent to the example of a comparison is obtained.

[0028] In the deposit efficiency of the glycerol of the hollow filament obtained by removing the glycerol which adhered superfluously from the result of Table 3, all are decreasing compared with the example of a comparison, and it turns out that a proper quantity of the glycerol can be adhered.

[0029]

[Effect of the Invention] The hollow fiber module to which only the proper amount made the glycerol adhere can reduce generating of the urethane oligomer from jointing extremely, the absorbance in UV (245nm) can attain 0.03 or less, and the hollow fiber module for artificial dialysis also with water permeability and the transparency engine performance equivalent to the former is obtained.

[Translation done.]